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A Planar Linear-to-Circular Polarizer

Chun-Hao Hsun, and Fu-Chiarng Chen*
National Yang Ming Chiao Tung University, Hsinchu, Taiwan.; e-mail: fchen@nycu.edu.tw

The circular polarization wave is favored in numerous industrial applications such as global navigation systems, satellite communications, and mobile communication systems. It is robust with multipath fading and Faraday rotational effect. The frequency-selective surface (FSS) is a planar structure that can be engineered to manipulate the polarization of propagating electromagnetic waves. Therefore, we designed the FSS as a polarization transformer which can convert a linearly polarized wave into a circular polarized wave. We used different types of resonators to construct the unit cell of the proposed FSS and deliberately adjusted the size of the constituent resonators. The conductor pattern was printed on a Rogers RT/droid 5880 substrate ($\varepsilon_r = 2.2$, loss tangent = 0.0009) with 0.8mm thickness. Based on the full-wave simulation results, we found that both the x- and y-polarized incident waves are equally divided into transmitted (S_{21}) and reflected (S_{11}) waves. Thus, it can work as a spatial power divider. The phase difference is 90 degrees between the x- and y-polarized scattering wave at 5.35 GHz. The linearly polarized wave whose polarization is lain 45 degrees from the x-axis is changed into circular polarization reflected and transmitted waves (with equal power dividing) after impinging on the FSS. Our proposed FSS design is a low-profile structure which is easy to fabricate. It can act as an intelligent reflective surface with polarization diversity capability.